Testing for measurement invariance of the Survey of Attitudes Toward Statistics: A comparison of Italian and Spanish students

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SURVEY OF ATTITUDES TOWARD STATISTICS (SATS)

Authors: Schau et al. (1995)
Items: 28 Likert type items (seven points scale)
Structure: 4 Factors

PURPOSE

To test measurement invariance of the Survey of Attitudes Toward Statistics (SATS) across countries and across time

PARTICIPANTS

Undergraduate Psychology Students enrolled in Introductory Statistics courses
181 Spanish students
186 Italian students

DATA ANALYSIS

Multigroup Confirmatory Factor Analysis via MACS (AMOS 6.0)

Testing strategy
- Weak invariance
- Strong invariance
- Strict invariance

Fit Criteria
- Hu and Bentler (1999) CFI > 0.95
- Cheung & Rensvold (2002) ▼CFI < 0.01
### RESULTS (1)

#### Unconstrained Models Fit indices

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>DF</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1 Spain</td>
<td>33.437*</td>
<td>21</td>
<td>.970</td>
<td>.982</td>
<td>.057</td>
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<tr>
<td>Time 2 Spain</td>
<td>28.585</td>
<td>21</td>
<td>.987</td>
<td>.992</td>
<td>.038</td>
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<tr>
<td>Time 1 Italy</td>
<td>24.679</td>
<td>21</td>
<td>.990</td>
<td>.994</td>
<td>.031</td>
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<tr>
<td>Time 2 Italy</td>
<td>36.486*</td>
<td>21</td>
<td>.994</td>
<td>.977</td>
<td>.063</td>
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<tr>
<td>Total</td>
<td>121.187*</td>
<td>84</td>
<td>.977</td>
<td>.987</td>
<td>.025</td>
</tr>
</tbody>
</table>

* Significant chi-square at .05

### RESULTS (2)

#### Measurement Invariant Models Fit Indices drop

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<tbody>
<tr>
<td>Weak invariance</td>
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<td>.004</td>
<td>.006</td>
<td>.002</td>
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<td>Strong invariance</td>
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<td>30</td>
<td>.144</td>
<td>.113</td>
<td>.041</td>
</tr>
<tr>
<td>Strict invariance</td>
<td>445.444</td>
<td>57</td>
<td>.133</td>
<td>.131</td>
<td>.039</td>
</tr>
</tbody>
</table>

### RESULTS (3)

Tests for invariance
Paired comparisons

### RESULTS (4)

Attitude changes by Country
Latent mean differences

### RESULTS (5)

Extreme response style by Country

### MAIN FINDINGS

Schau’s Four Factor Model of Attitudes toward Statistics show an adequate fit to the data of Spanish and Italian Students. Furthermore we found evidence of weak invariance across time and country. Strong invariance across time has shown an acceptable fit. However there is a lack of invariance in indicator intercepts when comparing Spanish and Italian students’ data. A tentative explanation of this is the existence of a differential extreme response style.